

## **Chapter 4**

### **ENVIRONMENTAL CONSIDERATIONS**

#### **INTRODUCTION**

The physical geography of an area affects the amount, type and direction of development. Natural factors such as climate, topography, geology, hydrology and soils are important because they influence the costs of development and serve as constraints on the suitability of an area for a given type of development or use.

#### **LOCATION**

Grant County is located in the north central portion of Kentucky in the Outer Bluegrass physiographic region. The county resembles a parallelogram in shape and is approximately 22 miles from north to south and 14 miles east to west. It covers a land area of 249 square miles or approximately 160,000 acres.

Williamstown is the largest city and the county seat. Williamstown is located in the east central portion of the county near Interstate 75. It is approximately half way between the urban centers of Cincinnati, Ohio and Lexington, Kentucky. The next two largest cities, Dry Ridge and Crittenden, are also located along Interstate 75 north of Williamstown. Crittenden is located at the northern edge of the county. The county's fourth and smallest city, Corinth, is located south of Williamstown near the county line and east of I-75.

#### **CLIMATE**

Grant County has a temperate and humid climate. Southerly winds predominate bringing moist warm air. The most common severe weather conditions are in the form of mild droughts or thunderstorms. Tornadoes are the most devastating severe weather, which occurs in the area. Tornadoes can occur almost anywhere in Kentucky and in any terrain, hilltop or valley bottom. Severe storms can occur in any month but are most frequent from March to July.

Long-term climatological data is available from the Williamstown weather station. The following discussion is based on averages for the period from 1965 to 1994 and extremes for the period 1948 to 1995. The coldest days occur in January when the monthly average temperature is 30.8° F. The warmest days occur in July with a monthly average temperature of 75.8° F. During the period from June to September, an average of 22 days will have a maximum temperature of 90° F or higher. The minimum temperature is expected to be 32° F or less on an average of 110 days, October through April. The coldest temperature on record is -23° F on January 19, 1994. the hottest recorded temperature was 104° F on July 15, 1954 and August 20, 1983.

Precipitation averages 43.8 inches annually. Records indicate that July and April tend to be the wettest months and January and February the driest. Precipitation in general is evenly distributed throughout the year. An average of 7.1 days per month will have precipitation of .10 inches or more.

#### **AIR QUALITY**

Air quality is monitored by the Division of Air Quality Control of the Kentucky Natural Resources and Environmental Protection Cabinet, Department for Environmental Protection. This division monitors compliance for standards for six criteria pollutants including sulfur dioxide, nitrogen, ozone, fluorides, hydrogen sulfide and particulates. Air quality is generally good in Grant

County and exceeds minimum Federal standards for all criteria pollutants. The location of sewage treatment plants is becoming an issue to future growth of residential development. Expansion of existing facilities and locations of new treatment plants needs to be done in accordance with projected population growth and potential sewer-ability. The landfill in recent years has had difficulty in preventing odor from going off site and disrupting outside activities. This use was initially permitted under an agricultural zoning designation, however, it now consists of a legal but non-conforming use. Future expansion of the existing landfill will be contingent upon the ability to control odor from going off site.

## **PHYSIOGRAPHY & GEOLOGY**

Grant County is located in the Outer Bluegrass physiographic region and is underlain by rocks of Ordovician age. Along the long central ridge, which extends through the county along the north-south axis, the area is underlain by the Fairview formation. Interstate 75 and U.S. 25 extend along this long, flat ridge. This upland region is characterized by long, broad, undulating to rolling ridge tops and short, hilly side slopes. It is dissected by lateral drains and steep walled, V-shaped valleys. The Fairview formation consists of alternating beds of limestone and shale. This formation may have small sinkholes with minor underground drainage.

The majority of the remainder of Grant County is underlain by Eden shale. These areas have long, winding, narrow rolling to hilly ridges and steep walled, V-shaped valleys. Short ridges extend laterally from the main ridges. The region is strongly dissected by small streams and lateral drains. Eden shale is a lumpy blue calcareous shale and mudstone with thin, evenly bedded limestone layers that are more common towards the base. It is almost entirely shale in places, but may be as much as one-half limestone in others.

The Cynthiana Formation is exposed in places along the Eagle Creek valley bottom and along tributaries to South Fork Licking River in the south end of the county including Crooked Creek and Coopertown Creek. The Cynthiana Formation consists of thick, irregularly bedded crystalline limestone with interbedded thin shale. Is very shaly in the upper part and grades downward to limestone with small amounts of shale. The Eagle Creek valley bottom itself is covered with alluvium of Quantary age. Alluvium is sand, gravel, silt and clay washed down and deposited on land by streams. There are no significant mineral resources in Grant County.

The topography ranges from nearly level to steep. Elevations range from 1000 feet in the south end of the county near Corinth to 550 feet along the Eagle Creek valley bottom. Eagle Creek, Licking River and South Fork Licking River drain the county. The chain of ridges running north and south along Interstate 75 in Grant County is a natural boundary between The Eagle Creek watershed and the Licking River watershed. The Eagle Creek watershed drains all of Grant County to the west of Interstate 75. The area east of Interstate 75 drains into the South Fork Licking River and Licking River.

## **SOILS**

Detailed soils information and soils maps can be found in the *Soil Survey of Grant and Pendleton Counties, Kentucky* published by the U.S. Department of Agriculture, Soil Conservation Service. The general soils map found in the Soil Survey shows that there are three soil associations in Grant County. Soil associations are generalized groupings of similar soils with common relief and drainage patterns. While specific soils information must be consulted to determine the suitability of a particular site for various land uses, soils associations can provide information for general planning purposes.

### ***EDEN ASSOCIATION***

The Eden association is found on steep, highly dissected, hilly areas. It consists predominately of steep to very steep soils that have clayey subsoil and is located on limestone and shale uplands. It is the dominant soil association in Grant County, occupying about 75 percent of the land area. In Grant County it consists of 91 percent Eden soils and 9 percent other minor soils. Eden soils are found on narrow ridge tops and steep hillsides. Eden soils are moderately deep, well drained and slowly permeable. They have a loamy or clayey surface layer and clayey subsoil.

The minor soils in this association include the well-drained Heitt and Lowell soils on narrow ridges and the moderately well drained Licking soils on stream terraces. Well-drained Nolin soils on narrow floodplains and the shallow Cynthiana soils on hillsides are also a part of this association.

The soils in the Eden association have poor potential for cultivated crops, hay and most specialty crops. The steepness of slope, clayey subsoil, poor workability and draughtiness are the main limitations to farming. These soils have fair potential for pasture and for woodland. Potential is poor for residential and other urban developments. The steepness of slope, moderate depth to bedrock, slow permeability, moderate shrink-swell potential and low strength are limitations and are difficult to overcome. Potential is poor for intensive recreation. Potential is fair for developing woodland wildlife and openland wildlife habitats. In Grant County, about two-thirds of this acreage is used for hay and pasture and one-third is wooded or covered with brush.

### ***LOWELL-NICHOLSON ASSOCIATION***

This association is found mostly on long, broad ridges, mainly in the north-central part of the county, and makes up about 21 percent of Grant County. It has deep, gently sloping to moderately well drained soils that have clayey and loamy subsoil. In Grant County, this association is about 54 percent Lowell soils, 32 percent Nicholson soils and 14 percent other minor soils.

Lowell soils are found on both ridge tops and hillsides. In most places, the Lowell soils are at a slightly lower elevation than the Nicholson soils. Lowell soils are deep and well drained. Permeability is moderately slow. They have a surface layer of silt loam and clayey subsoil.

The Nicholson soils are gently sloping to sloping and are found on fairly broad ridges. Nicholson soils are deep, moderately well drained and have a slowly permeable fragipan. They have a surface layer of silt loam. The upper part of the subsoil is loamy, the middle part is a fragipan, and the lower part is clayey. The Eden soil is a minor soil of this association, occurring on the lower part of hillsides.

Areas of this association are used mainly for crops and pasture. Most of the acreage is in grassland. The broader ridges are used for cultivated crops, mainly corn, and tobacco. The steepness of the slope and clayey subsoil of the Lowell soils and the slowly permeable fragipan of the Nicholson soils are the main limitations to farming and most other uses.

The soils in this association have fair potential for cultivated crops and most specialty crops. If the soils are cultivated, erosion is the main management concern and erosion control practices are needed. These soils have good potential for pasture, hay crops and woodland. Potential is fair for intensive recreation and for residential and other urban developments. The steepness of the slope, moderate shrink-swell potential, low strength and slow permeability are limitations and are difficult to overcome.

### ***NOLIN-LICKING-OTWELL ASSOCIATION***

This association consists of deep, nearly level to moderately steep, well drained and moderately well drained soils that have loamy or clayey subsoil. It is located on floodplains and stream terraces. In Grant County it is found along the Eagle Creek valley bottom. It makes up about four percent of Grant County. This association consists of about 40 percent Nolin soils, 20 percent Licking soils, 16 percent Otwell soils and 24 percent of other soils.

The Nolin soils are nearly level and are found on floodplains. The Nolin soils are deep, moderately well drained and slowly permeable. They have a surface layer of silt loam and loamy subsoil. The Licking soils are gently sloping to moderately steep and are found on stream terraces. The Licking soils are deep, moderately well drained and slowly permeable. They have a surface layer of silt loam and clayey subsoil.

The Otwell soils are nearly level to sloping and are on stream terraces. The Otwell soils are deep, moderately well drained and have a slowly permeable fragipan. They have a surface layer of silt loam and clayey subsoil. Other soils of minor extent in this association are the somewhat poorly drained McGary soils and the well drained Elk soils on stream terraces. The well-drained Woolper soils are found on toe slopes and stream terraces.

Most areas of the Nolin - Licking - Otwell Association are cleared and used for farming. Much of the acreage is used for cultivated crops. The steeper areas are used for pasture and hay. The soils in this association have good potential for cultivated crops and most specialty crops. If the soils are cultivated, erosion is the main management concern and erosion control practices are needed. These soils have good potential for pasture, hay crops and woodland. Potential is fair for intensive recreation. Potential is poor for residential and other urban developments. The steepness of slope, seasonal high water table and flooding are limitations and are difficult to overcome.

### ***HYRIC SOILS***

Hydric soils are those soils which are saturated, flooded or ponded long enough during the growing season to develop anaerobic conditions in the upper part. The presence of hydric soils is an indication that wetlands may exist in an area. Under currently accepted definitions, an area is considered a wetland if it has hydric soils, hydrophytic vegetation (plants that are adapted to growing in wet conditions), and wetlands hydrology. Wetlands hydrology means that the area is either permanently or periodically inundated or the soil is saturated to the surface at some time during the growing season. The only hydric soil in Grant County is Robertsville silt loam. It is hydric due to saturation. Two other soil types, McGary silt loam and Newark silt loam, may have inclusions of hydric soils. This means that areas mapped as these soil types may include small areas of hydric soils in poorly drained low spots. In Grant County, these hydric soils are found in the Nolin-Licking-Otwell soils association and support or would have supported woody vegetation under natural conditions. Robertsville soils are found only in very limited locations in Grant County. There are a few small areas of Robertsville soils along Clark's Creek near Eagle Creek. Due to the hilly nature of the area and the limited existence of hydric soils, wetlands are not a limiting factor for development in Grant County.

### ***PRIME FARMLAND SOILS***

According to the U.S. Department of Agriculture, Soil Conservation Service, prime farmland is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber and oilseed crops and is also available for these uses. Prime farmland can be cropland, pastureland, rangeland, forest land or other land but not urban built-up land or water.

Prime farmland has the soil quality, growing season and moisture supply needed to economically produce sustained high yields of crops when treated and managed according to

acceptable farming methods. In general, prime farmlands have an adequate and dependable water supply from precipitation or irrigation, a favorable temperature and growing season, acceptable acidity or alkalinity, acceptable salt and sodium content and few or no rocks. They are permeable to water and air. Prime farmlands are not excessively erodible or saturated with water for a long period of time. They either do not flood frequently or are protected from flooding.

The following soils found in Grant County are considered to be potential prime farmlands.

- AlB - Allegheny loam, 2 to 6 % slopes
- EkB - Elk silt loam, 2 to 6 % slopes
- ELA - Elk silt loam, rarely flooded, 0 to 2 % slopes
- ElB - Elk silt loam, rarely flooded, 2 to 6 % slopes
- En - Elk-Newark Complex
- LcB - Licking silt loam, 2 to 6 % slopes
- Mc - McGary silt loam 1,2
- Ne - Newark silt loam 1,2
- NtB - Nicholson silt loam, 2 to 8% slopes
- No - Nolin silt loam,
- Nw - Nolin silt loam, frequently flooded 1,2
- OtB - Otwell silt loam, 2 to 6 % slopes
- OwA - Otwell silt loam, rarely flooded, 0 to 2 % slopes
- Ro - Robertsville silt loam 2
- Wo - Woolper silty clay loam
- Zp - Zipp silty clay loam 1,2

In addition to prime farmland, the Soil Conservation Service has also identified farmlands of statewide importance. This is land other than prime farmlands that is of statewide importance for the production of food, feed, fiber, forage and oilseed crops. Generally, farmlands of statewide importance include those that are nearly prime farmland and that economically produce high yields of crops when treated and managed according to acceptable farming methods. Some may produce as high a yield as prime farmlands if conditions are favorable.

The following soils found in Grant County may be farmland of statewide importance:

- AlC - Allegheny loam, 6 to 12 % slopes
- EdD - Eden silty clay loam, 6 to 15 % slopes
- EkC - Elk silt loam, 6 to 12 % slopes
- ElC - Elk silt loam, 6 to 12% slopes, rarely flooded
- HeC - Heitt silt loam, 6 to 12 % slopes

LcC - Licking silt loam, 6 to 12 % slopes

LoC - Lowell silt loam, 6 to 12 % slopes

OtC - Otwell silt loam, 6 to 12 % slopes

While specific determinations as to the location of prime farmlands and farmlands of statewide importance must be made on a site-by-site basis, generalizations can be made for each soil association. The Eden soil association is made up of 91 percent Eden soils. Eden soils are not considered prime farmland soils. They may be farmlands of statewide importance on slopes of less than 15 percent. Of the predominate minor soils in this association, the Heitt and Lowell soils may also be soils of statewide importance. The Nolin silt loam soils, found on narrow floodplains, may be prime farmland soils.

Of the Lowell - Nicholson association, the Nicholson soil, found on broad ridge tops, is a prime farmland soil. The Lowell silt loam and the Eden silt loam, generally found at lower elevations, are soils of statewide importance. The Nolin - Licking Otwell association, found on the floodplain of Eagle Creek, is predominately made up of prime farmland soils.

## **SLOPES**

Land uses vary in their sensitivity to slope. Virtually flat land can be used for intensive activity, while slopes in excess of 20 percent present limitations so great that development is not feasible, both practically and financially. Residential development can take place on small scattered sites utilizing land that industrial development, with its more expansive land requirements, must bypass. In addition, the location and concentration of slopes in the form of hills, ridges, valleys and plains can force development into large clusters or break it up into dispersed patterns. The variation in topography that characterizes Grant County has structured the form of its cities and guided the location of its transportation arterials. The suitability of different degrees of slope for development is shown in Table 4-1 and Figure 4-1.

CRITICAL SLOPE GRANT COUNTY,  
KENTUCKY

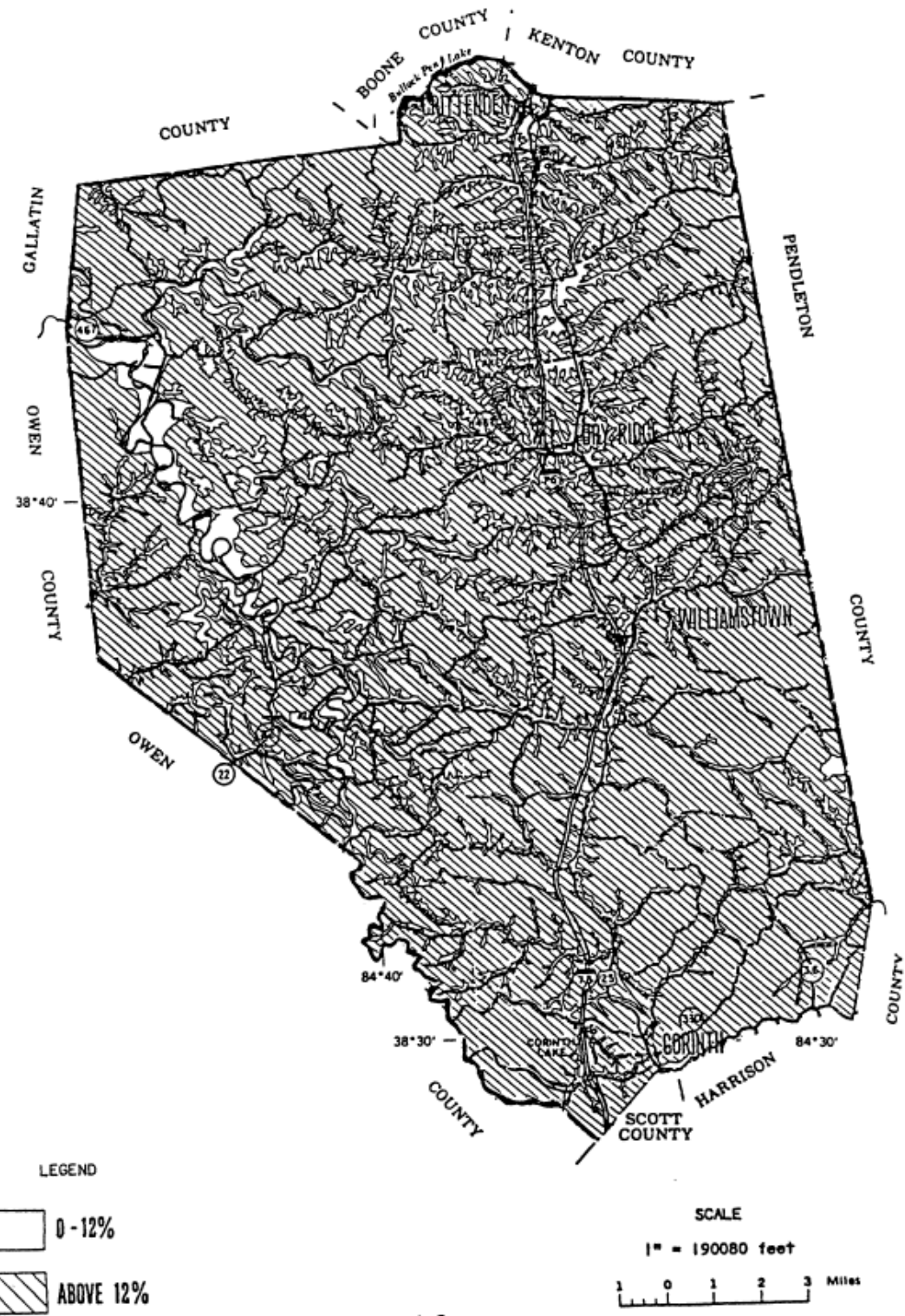


TABLE 4-1				
slope suitability for urban development				
LIMITATIONS	SUITABILITY RATING	RESIDENTIAL	COMMERCIAL	INDUSTRIAL PARK
Slight	Optimum	0-6 %	0-6 %	0-2 %
Moderate	Satisfactory	6-12 %	6-12 %	2-6 %
Severe	Marginal	12-18 %	12-18 %	6-12 %
Very Severe	Unsatisfactory	18 % +	18 % +	12 % +

Source: Kiefer, Ralph W., "Terrain Analysis for Metropolitan Area Planning," Journal of the Urban Planning Division, Proceedings of the American Soc. of Civil Engineers, Dec., 1967

Visual indications of unstable slopes include previous slides or slumps, cracking of the top of the slope, tilting of fences, retaining walls, utility poles or trees, new cracks in foundations and sidewalks and slowly developing and widening cracks in the ground or paved areas. Development on steep slopes can accelerate erosion, increase run-off and decrease the volume of water absorbed and filtered as groundwater. Damage to buildings and other man made structures can occur on unstable slopes. Commercial and industrial development should be restricted on slopes steeper than 12 percent. Developers of residential property on such slopes should be required to prove that the construction techniques employed will overcome the site's limitations. Slope is more restrictive for subdivision development than for scattered county residences.

Most development in Grant County has occurred on land with a slope of 12 percent or less. Areas of steeper slope conditions have been included in subdivisions, but most often are used as the undeveloped rear portions of deep lots.

## FLOODPLAINS

Floodplains are low-lying areas, which are susceptible to flooding. None of the cities in Grant County are located in or near floodplain areas. Although no floodplain maps have been prepared for Grant County, flooding can occur along Eagle Creek. To date, little or no development has occurred along Eagle Creek. Future development in the floodplain of Eagle Creek should be prohibited to prevent future flood damages and a reduction in the storage capacity of the floodplain.

## ENDANGERED SPECIES

The primary concern for the impacts of development on plant and animal life are the effects on rare and endangered species. There are ten animal species and two plant species of potential concern in Grant County according to the Kentucky Department of Fish & Wildlife Resources. These are as follows:



TABLE 4-2		
species of concern		
COMMON NAME	SPECIES	STATUS
Johnny Darter	<i>Etheostoma nigrum</i>	Federal Review Candidate State Endangered
Milk Snake	<i>Lampropeltis triangulum</i>	State Special Concern
Great Blue Heron	<i>Ardea herodias</i>	State Special Concern
Common Barn Owl	<i>Tyto alba</i>	State Special Concern
Bewick's Wren	<i>Thryomanes bewickii</i>	Federal Review Candidate State Special Concern
Loggerhead Shrike	<i>Lanius ludovicianus</i>	Federal Review Candidate
Henslow's Sparrow	<i>Ammodramus henslowii</i>	Federal Review Candidate State Special Concern
Vesper Sparrow	<i>Pooecetes gramineus</i>	State Endangered
Savannah Sparrow	<i>Passerculus sandwichensis</i>	State Special Concern
Salamander mussel	<i>Simpsonaias ambigua</i>	Federal Review Candidate State Threatened
Short's Goldenrod	<i>Solidago shortii</i>	Federal Endangered
Running Buffalo Clover	<i>Trifolium stoloniferum</i>	Federal Endangered

Existence of Short's Goldenrod and Running Buffalo Clover in Grant County has not been verified, but these species could occur in the county. While there are currently no state or local regulations protecting endangered species, projects which are Federally funded or require significant Federal actions (such as permits), must insure that the proposed project does not negatively impact federally protected species.